

## CLEAN COPY OF AMENDED CLAIM SET

## CLAIMS

1. Apparatus for the stimulation of molecular resonance by the application of very low intensity electromagnetic radiation, comprising a laser of multiple line cavity resonance consisting of a laser diode with a collimated or near collimated beam, said beam being passed through a phase cancellation optical element having the characteristic of cancelling several of the central lines of the laser frequency while leaving the higher and lower frequencies generally uncanceled such that the beat frequency of the passed frequencies forms a pattern of interference of constructive and destructive nodes in which the diameter of the beam is set to be a sufficiently low multiple of the wavelength of the beat frequency to allow a substantial Fresnel zone to be apparent in the beam and in which an aperture is provided to select a portion of the Fresnel zone wherein a substantial majority of destructive nodes are apparent relative to the constructive nodes and in which means are provided to modulate the laser frequency.

2. Apparatus as claimed in Claim 1, wherein the laser frequency is varied by adjusting the current on a laser diode.

3. Apparatus as claimed in Claim 1 wherein the laser frequency is varied by physical alteration of a secondary cavity such as a crystal provided to double the primary frequency.

4. Apparatus as claimed in Claim 1 wherein the modulation frequency is a harmonic of the beat frequency.

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5. Apparatus as claimed in Claim 1 wherein the modulation frequency is a harmonic of a specific molecular resonance.

6. Apparatus as claimed in Claim 1 wherein the aperture or angle of the beam passage through the cancellation device may be varied consequently varying the beat frequency.

7. Apparatus as claimed in Claim 1 wherein the selected portion of the beam may be varied to alter the balance between constructive and destructive nodes.

8. Apparatus as claimed in Claim 1 wherein the means for modulating the laser frequency is the consequential mode transition of a laser diode in pulse mode.

9. Apparatus as claimed in Claim 8 where the laser diode mode is held within bounds by reflection from a Bragg grating so that the modulation of the Fresnel zone nodes is a consequence of the Fourier transform of the pulse.

10. A method of stimulation of molecular resonance by the application of very low intensity electromagnetic radiation modulated at resonant frequencies of molecules of high Q by use of a laser of multiple line cavity resonance consisting of a laser diode with a collimated or near collimated beam, said beam being passed through a phase cancellation optical element said cancellation device having the characteristic of cancelling several of the central lines of the laser frequency while leaving the higher and lower frequencies generally uncanceled such that the beat frequency of the passed

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frequencies forms a pattern of interference of constructive and destructive nodes, in which method the diameter of the beam is set to be a sufficiently low multiple of the wavelength of the beat frequency to allow a substantial Fresnel zone to be apparent in the beam and in which an aperture is provided to select a portion of the Fresnel zone wherein a substantial majority of destructive nodes are apparent relative to the constructive nodes and in which means are provided to modulate the laser frequency.

11. Apparatus for the production of sub picosecond light pulses, the apparatus comprising a laser producing a collimated or near collimated beam, a phase cancellation optical element through which said beam is passed, said phase cancellation optical element being formed by the series combination of a first diffraction grating, a refractive element and a second diffraction grating, whereby a pattern of interference of constructive and destructive nodes is formed in which the diameter of the beam is set to be a sufficiently low multiple of the wavelength of the beat frequency to allow a substantial Fresnel zone to be apparent in the beam, the apparatus further including means for pulsing the laser with short duration pulses to produce for each pulse an isolated traverse through the frequency mode of the laser.